GRINDER WITH EASILY INSTALLABLE/DETACHABLE GRINDING DISC

This is a continuation-in-part of application no. 10/408,311, filed April 8, 2003, the entirety of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention is related to a grinder, and more particularly to a grinder in which the rotary shaft can be fixed without using any tool for replacing the grinding disc.

A conventional pneumatic or electric grinder has a grinding disc mounted at bottom end for grinding or buffering a work piece. When grinding different work pieces, it is necessary to frequently replace the grinding disc.

In the conventional grinding structure, an eccentric rotary shaft is disposed at bottom end of the rotor (pneumatic grinder) or the motor (electric grinder). A hexagonal nut is fixed at bottom end of the rotary shaft. A worm is disposed at the center of the top face of the grinding disc. The worm is screwed in the nut, whereby the grinding disc is drivable by the rotary shaft. In addition, a protective sheath is disposed at bottom end of the grinder for covering the grinding disc and providing a protective effect.

The conventional grinder is equipped with a flat wrench. When

replacing the grinding disc, the wrench is extended through the gap between the protective sheath and the grinding disc to fit onto the nut and prevent the rotary shaft from rotating. Under such circumstance, the grinding disc can be untightened or tightened. Such procedure is quite inconvenient, for the protective sheath obstructs the operator from seeing the nut. Therefore, it is hard for the operator to fit the wrench onto the nut. Moreover, the rotary shaft is eccentrically arranged and has unfixed position so that the operator often needs to try many times for wrenching the nut.

Furthermore, in case there is no tool available, it will be impossible to replace the grinding disc.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a grinder in which a structure is provided for fixing the rotary shaft, whereby the grinding disc can be replaced without using any tool.

The present invention can be best understood through the following description and accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective assembled view of a preferred embodiment of the present invention;

Fig. 2 is a perspective exploded view according to Fig. 1;

Fig. 3 is a longitudinal sectional view according to Fig. 1;

Fig. 4 is a bottom view according to Fig. 1;

Fig. 5 is a partially sectional view according to Fig. 1;

Fig. 6 is a perspective assembled view of the support tray, bracket and detent members of the present invention;

Fig. 7 is a top view according to Fig. 6, showing that the detent members are opened;

Fig. 8 shows that the rotary disc of the present invention is turned to another position;

Fig. 9 is a top view according to Fig. 8; showing that the detent members are closed; and

Fig. 10 is a bottom view of the present invention in the state of Fig. 9.

Fig. 11 is a perspective exploded view of a part of another embodiment of the present invention;

Fig. 12 is a perspective exploded view of still another embodiment of the present invention;

Fig. 13 is a perspective assembled view of the embodiment of Fig. 12, showing that the detent members are opened;

Fig. 14 is a top view according to Fig. 13;

Fig. 15 is a bottom view of the embodiment;

Fig. 16 is a view according to Fig. 14, showing that the detent members are closed;

Fig. 17 is a bottom view according to Fig. 16; and

Fig. 18 is a bottom view of still another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to Figs. 1 and 2. According to a preferred embodiment, the grinder 10 of the present invention includes a main body 20, a rotary shaft 40, a rotary disc 50, a bracket 60, a support tray 70 and detent members 80.

The main body 20 has a barrel section 22. At least the bottom end of the barrel section is circular. The main body also has a circular loop section 24 having a diameter larger than that of the barrel section 22 and positioned at bottom end of the barrel section. The inner circumference of the loop section has three connecting sections 26 arranged at equal intervals and connected between the barrel section 22 and the loop section 24. The three connecting sections define three hollow sections 28 at equal intervals. In addition, two figure marks 30, 32 are disposed on top face of one of the connecting sections. Referring to Fig. 3, a space 34 is formed in the barrel section 22 in which a driving unit 35 is accommodated. In this embodiment, the grinder is a pneumatic grinder, the driving unit 35 is a pneumatic cylinder 36 in which a rotor 37 is disposed.

The rotary shaft 40 is eccentrically pivotally connected with bottom end of the driving unit 35 and is driven by the driving shaft 38 of the driving unit. The rotary shaft is eccentrically arranged so as to provide a vibration effect. The bottom end of the rotary shaft 40 is formed with an axial thread hole 42. In addition, an annular toothed section 45 is formed along the circumference of the

bottom end of the rotary shaft as shown in Fig. 4.

The rotary disc 50, referring to Figs. 1 and 2, in this embodiment, is composed of three arched bodies 52 having equal arch length (120 degrees). The three arched bodies 52 are annularly arranged around the loop section 24 to shield the top face of the connecting sections 26.

The bracket 60 has a disc-like body section 62 and three legs 64 arranged on the circumference of the body section at equal intervals. In addition, the body section 62 is formed with a central through hole 65 and three oblique guide slots 66 at equal intervals. Each guide slot has an inner end 661 and an outer end 662. In radial direction, the inner end 661 is closer to the center of the body section 62, while the outer end 662 is farther from the center of the body section. The bracket 60 is mounted in the loop section 24 with the three legs 64 respectively extending through the three hollow sections 28. Each leg is fixed at a pivot hole 521 of the arched body 52 by a screw 69 as shown in Fig. 5. The three arched bodies 52 are respectively fixed with the three legs so that the arched bodies keep having a circular configuration without departing from each other. When rotating the rotary disc 50 on the loop section 24, the bracket 60 is driven and moved. The legs 64 and the guide slots 66 are concentric with the body section 62 and the body section is concentric with the driving shaft 38 of the driving unit 35.

The support tray 70 is formed with a central circular hole 72. Three rail channels 74 are radially formed on the top face of the support tray 70 at equal angular intervals.

Three plate-like detent members 80 respectively disposed in the three rail channels 74 and slidable along the rail channels. An inner end of each detent member 80 is formed with an arched toothed section 82 having several teeth. The three arched toothed sections 82 form a circular configuration. The pitch between the teeth of the toothed section 82 is equal to the pitch between the teeth of the annular toothed section 45 of the rotary shaft 40. Three guide posts 84 are respectively fixed with the three detent members 80.

After the detent members 80 are mounted into the support tray 70, the support tray is fixedly connected with small projections 241 formed on inner circumference of the loop section 24 by three screws 86 as shown in Figs. 2 and 3. Accordingly, the support tray is fixed in the loop section. The support tray and the detent members right attach to the bottom face of the body section 62 of the bracket 60. Referring to Fig. 6, the three guide posts 84 are fitted in the guide slots 66. The support tray 60 is concentric with the bracket 70.

After the components 60, 70, 80 are mounted in the loop section 24, as shown in Fig. 3, the annular toothed section 45 of the bottom end of the rotary shaft 40 extends into the bracket and the circular hole 72 of the support tray.

A hollow protective sheath 90 made of hard plastic or rubber material is fitted around the loop section 24 to provide a protective effect.

Fig. 1 is a perspective assembled view of the present invention, in which the rotary disc 50 has at least one window 55 (which is inward recessed in this embodiment). The window 55 corresponds to the connecting section 26 having the two marks 30, 32. In Fig. 1, the window 55 is right positioned at the mark 30 which is a figure of a wrench. Under such circumstance, the rotary disc 50 is positioned in an opened position. In this position, as shown in Fig. 7, the guide posts 84 are positioned at outer ends 662 of the guide slots 66 and the three detent members 80 are expanded outward. In this state, referring to Fig. 4, the rotary shaft 40 is not restricted and can freely rotate. After activating the grinder, the rotary shaft can drive the grinding disc (not shown) to grind a work piece.

When replacing the grinding disc, the operator clockwise turns the rotary disc 50 to a closed position as shown in Fig. 8, in which the other mark 32 is exposed through the window 55. The mark 32 is a figure showing that a wrench is fitted onto a nut to indicate the operator of the restriction of the rotary shaft.

Referring to Fig. 8, when the rotary disc 50 is clockwise angularly displaced, the bracket 60 is synchronously rotated. At

this time, the angular positions of the three guide slots 66 are changed and the guide posts 84 are moved from the outer ends 662 of the guide slots to the inner ends 661 thereof as shown in Fig. 9. When the guide posts 84 are displaced, the detent members 80 are driven by the guide posts to inward slide along the rail channels 74 to a closed position, the three detent members contract and the arched toothed sections 82 thereof are closed into a complete circle.

Under such circumstance, referring to Fig. 10, the arched toothed sections 82 of the detent members are engaged with the annular toothed section 45 of the rotary shaft 40 to fix and prevent the rotary shaft from rotating. An operator can screw the worm of the grinding disc into the thread hole 42 of the rotary shaft or unscrew the worm out of the thread hole so as to replace the grinding disc.

It should be noted that when the three detent members 80 are closed, the three arched toothed sections 82 form a circle having a circumferential length equal to the circumferential length of the circle defined by the eccentric rotation of the rotary shaft 40. Therefore, after the grinder stops operating, no matter in what angular position the rotary shaft stops, the rotary shaft is clamped and fixed by the detent members.

When activating the grinder, the rotary disc 50 is counterclockwise turned back to the opened position as shown in Fig.

l to move the guide posts 84 to the outer ends of the guide slots. At this time, the detent members are restored to the expanded state as shown in Fig. 7 and disengaged from the rotary shaft.

In addition, three locating sections 76 can be disposed on the support tray at equal intervals as shown in Fig. 9. Three dents 68 are disposed on the body section 62 of the bracket at equal intervals. Two sides of the dent 68 abut against the locating section 76 to serve as the dead end of the movement of the rotary disc and the bracket.

By means of simple operation, the rotary shaft can be fixed or released for replacing the grinding disc without using any tool. This is convenient and facilitates the operation.

The marks 30, 32 enable an operator to judge whether the rotary shaft is freely rotatable or fixed.

Fig. 11 shows the bracket 92 and detent members 95 of another embodiment of the grinder of the present invention. In this embodiment, three guide slots 96 are respectively formed on the three detent members 95, while the three guide posts 94 are disposed on the bracket 92 and inserted in the guide slots 96. Accordingly, when rotating the bracket 92, the detent members 95 are driven to displace along the rail channels.

Fig. 12 shows still another embodiment of the grinder 100 of

the present invention, in which the main body 110, rotary disc 112, bracket 114, support tray 116 and detent members 120 are identical to those of the first embodiment.

This embodiment is mainly different from the first embodiment in that an inner end of one detent member 120a of the three detent members is formed with an arched toothed section 125, while the inner ends 126 of the other two detent members 120b, 120c are free from any toothed section. The inner ends 126 can be plane faces, arched faces or inward recessed as shown in Fig. 12.

Similarly, referring to Figs. 14 and 15, when the three detent members 120 are positioned in the expanded position, the rotary shaft 118 is not restricted so that the grinding disc is driven to freely rotate.

When replacing the grinding disc, the bracket 114 is turned to the closed position as shown in Fig. 16. At this time, the three detent members 120 are driven to inward move along the rail channels 117 to the closed position as shown in Fig. 17. Under such circumstance, the toothed section 125 of the detent member 120a engages with the toothed section 119 of the rotary shaft 118 so that the rotary shaft cannot rotate. At this time, the grinding disc can be replaced.

When the three detent members are closed, in the case that the position of the rotary shaft 118 is not adjacent to the detent member

120a, but one of the other two detent members 120b or 120c, for example, adjacent to the detent member 120b as shown by phantom line of Fig. 16, during closing procedure of the detent member 120b, the inner end 126 of the detent member 120b will push the rotary shaft to move. At this time, the center c of the rotary shaft will angularly displace along the arched line d to the position as shown by solid line of Fig. 16. Under such circumstance, the rotary shaft is engaged with the toothed section 125 of the detent member 120a. In other words, when the detent members are closed, no matter where the rotary shaft is positioned, the rotary shaft will be engaged with the detent member 120a and fixed. Also, after the three detent members are closed, the inner ends 126 of the detent members 120b, 120c define a narrow space within which the rotary shaft is restricted. Therefore, the rotary shaft cannot be disengaged from the detent member 120a.

Fig. 18 is a bottom view of still another embodiment of the present invention, in which the inner ends of two detent members 130a of the three detent members 130 are formed with arched toothed sections 135, while the inner end of the other detent member 130b is free from any arched toothed section. The inner end of the other detent member can be a plane face, arched face or inward recessed.

Similarly, when the detent members are closed, the rotary shaft cannot be disengaged from the detent members 130a.

It should be noted that the bracket can be directly exposed

to outer side of the main body, whereby an operator can directly turn the bracket.